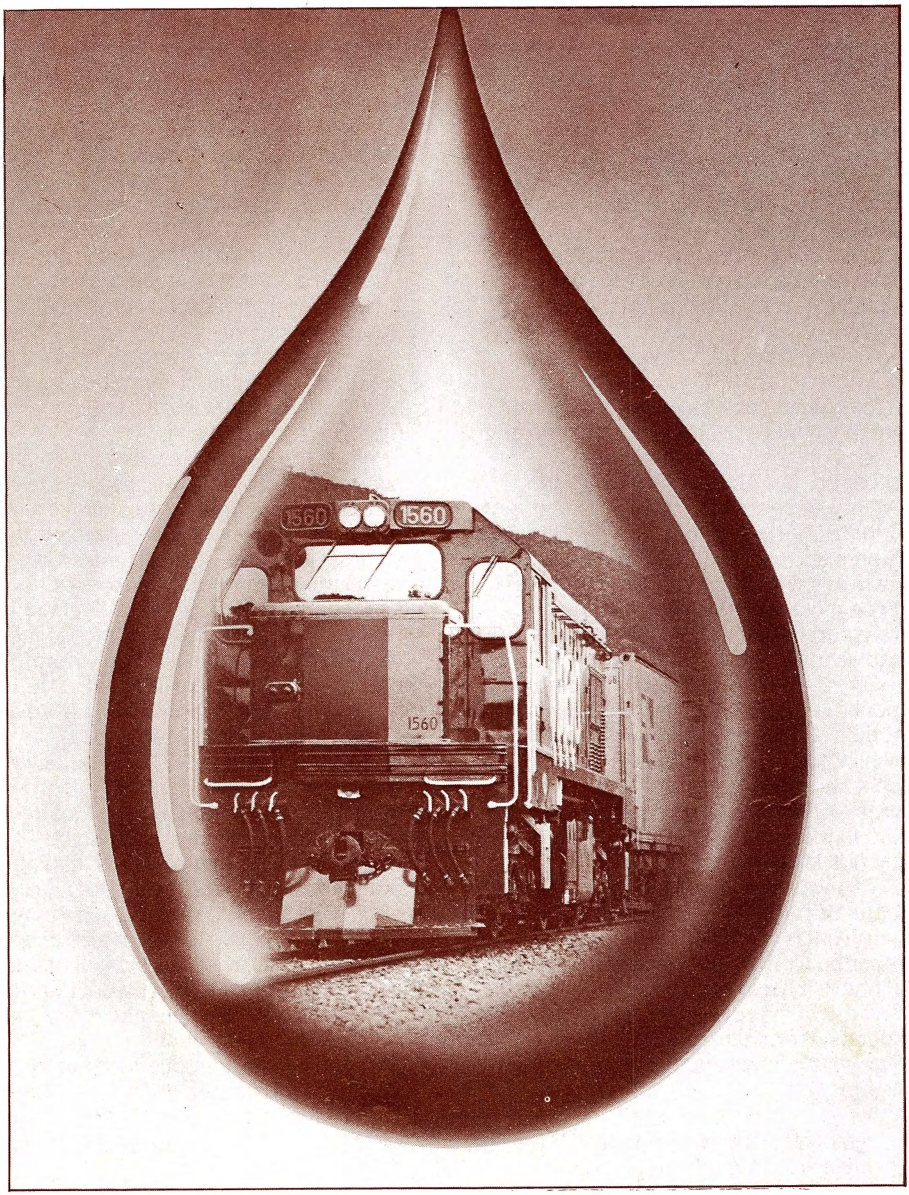
Railways and Energy



Railways

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We depend on oil for most of our transport fuels, our plastics and many other chemicals. But the supply is rapidly running out. And demand continues to force prices up.

Many people are working to develop other energy sources, but they are racing against time, the time when the oil wells dry up.

Railways can help buy some of that valuable time.

Long-distance heavy haulage railways are much more energy-efficient than any other significant form of surface transport. In 1977 the New Zealand Energy Research and Development Committees consultants presented figures showing that New Zealand Railways were between three and seven times more fuel efficient than road transport (and more efficient than sea and air too).

On 20-21 August 1980, NZR carefully monitored the performance of train number 661, an overnight Auckland to Wellington express goods, to show just what could be done. Train 661 used 3639 litres of diesel fuel to shift 920 tonnes, 580 tonnes of which was payload, over the 668 kilometre run.

This was equivalent to moving each tonne of cargo 108 kilometres on a litre of fuel. That is 5.1 times better than the best reported New Zealand figure for big rigs in heavy long-distance road transport. And it is at express speeds: at the slower speeds of ordinary goods trains, Railways' fuel efficiency would be even higher.

In fact NZR's energy efficiency stacks up quite well by world standards. In America it is reckoned that "Trains are four times more energy efficient than highway transportation, seven times more efficient than coastal shipping, 125 times more efficient than air." British trains hauling bulk freight are considered to be between 1.2 and 6 times more fuel efficient than road for the same job. That's in a flatter country than New Zealand, with more roads and freight trains running only 119 km on average.

This high level of energy efficiency is the result of continual improvement in New Zealand Railways' operating methods over the years.

When the railways system was built last century, its main purpose was to help develop the country by providing cheap transport. The result was a widely spread network with many branch lines. Since then improvements in road feeder services have enabled New Zealand Railways to cut its network back to the more intensively used routes where railways are more fuel efficient.

Train loads on branch lines are small, so that much of the capacity of a locomotive is wasted. The locomotive and the guard's van make up a high proportion of the train weight. Most freight moves only one way, which means that a lot of fuel is used carting empty wagons. As a result a lot more energy is needed to move each tonne of goods on a branch line than elsewhere: some closed branch lines might actually have needed more fuel to work them by rail than is now used by road.

Train Control, introduced in the 1920s, improved the flow of traffic. Centralised Traffic Control signalling, the first section of which was introduced in 1937, brought further improvements.

Another major improvement was the

replacement of fuel-inefficient steam locomotives with diesel-electrics (that is, locomotives with a diesel engine driving an electric generator which provides power for electric traction motors) during the 1950s and 1960s. United States research has shown that diesels use only one fifth the amount of energy required by steam to do a similar job.

The latest advance is the computerised Traffic Monitoring System which, in addition to providing a better service to customers, helps reduce fuel use by cutting movement of empty wagons to a minimum.

However, while Railways are clearly more energy-efficient than other forms of transport for long-distance freight movements, they have less of an advantage when it comes to shifting people. On broad figures a typical long-distance train and a bus use roughly the same amount of energy to move each person. But in many parts of New Zealand it is easier to get enough people to fill a bus than a train, so that buses will often use less energy per passenger shifted than a train. A well loaded suburban train, however, is extremely fuel efficient. Both are, of course, more energy efficient than private cars.

Railways' energy efficiency will be improved even more when the North Island Main Trunk line is electrified. Modern electronics allow potential energy, that would otherwise be lost when a train runs down hill, to be converted to electricity for use by other trains in the area. This is called regenerative braking. In the hilly country at the centre of the North Island as much as a fifth of all the energy required could be recovered in this way.

Added to the overall efficiency of electric locomotives, this could reduce energy requirements by a quarter compared to diesel locomotives: the exact figure depends less on the railway than on the efficiency of the power stations and transmission lines feeding it.

Electricity is generally cheaper than diesel oil: diesel is imported while most electricity is generated from New Zealand energy sources. Electrifying the Main Trunk will free New Zealand's main transport artery from the vagaries of Middle East Oil supplies using tried and proven economical technology.

Electrification will help New Zealand Railways offer a faster and more efficient service, making it more attractive to customers. Not only will it save energy on the traffic now flowing, but it will also help Railways attract more traffic to the benefit of New Zealanders as a whole.

Energy Transport

Railways play an important role moving the raw materials for energy production. Much New Zealand coal depends on rail for transport, with heavy traffics from Westland, Southland and the Waikato. Railways carry a lot of oil products from ports to inland centres — an example is the daily oil and petrol train from Wellington to Palmerston North. Last year Railways carried a total of 611,860 tonnes of oil products. Railways also handle increasing amounts of LPG and keep a close eye on new energy schemes to ensure that rail plays its part in these important future developments.


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